a distance of two hundred and fifty feet through a wall twenty inches thick. He expects that it will be fifteen years before the process is made perfect. And X-Ray science is already well developed. At a former meeting of the National Society for Study of Education at Atlantic City the close of two decades of test making was celebrated as establishing their value. Less haste and more consistent checking of results against standards will certainly help avoid giving offense to well wishers, adding confusion to the already confused or lending support to those who are skeptical of the method under any circumstances. Just as the test maker now speaks assuredly of the value of his instrument so may the project advocate by patient progress be able to justify it both as method and subject matter.

L. R. DROWN

II

THE DEVELOPMENT OF ROADS IN VIRGINIA

Since the beginning of time roads have played a large part in history. A people may be said to be progressing when they become discontent with the simple things gotten from nature about them and seek to get goods from their neighbors. To obtain these goods from their neighbors they must develop some means of transportation.

The first stage in the development of transportation is the pack-train state. Here the man follows old foot-paths which have been artificially cleared. The pack mule may still be seen in more than one-half of the inhabited world today. Especially is this true of South America and a large part of our continent.

When or where the first road was built is not known, but Herodotus speaks of a great Egyptian road on which King Cheops employed one hundred thousand men for ten years. It was built of massive stone blocks ten feet deep and lined on both sides with temples, mausoleums, porticoes, and statues. The streets of Babylon were paved in 2,000 B. C. Several well-surfaced roads radiated to neighboring cities. Before its fall Carthage was the center of a highly developed road system. The ancient Peruvians also had a wonderful system of national roads connecting all the principal parts of the empire.

Bridges were constructed at an early date, too. The Chinese built roads as public works as early as 2,900 B. C. The Euphrates at Babylon was crossed by a stone bridge prior to 2,000 B. C.

Although the Romans were the first to construct and maintain costly roads, they did not begin until late in their history. The first Roman road known was the "Appian Way" or "Queen of Roads," begun in 312 B. C. by Appius Claudius. At first it stretched from Rome to Capua, about one hundred and forty-two Italian miles. This road is still in use, so it must have been built properly.

At first the Roman roads were built so the armies could move quickly; but later, they served as a basis of a great commerce which made the Roman Empire one of the greatest the world has ever known.

In France the appointment of Colbert as comptroller of finance about 1661 showed a revival of interest in roads. During the administration fifteen thousand miles of hard road were built. The peasants were forced to do this work under the old feudal institution of the "corvee," which prevailed until Turgot in 1774 abolished some of its most objectional features. The present system was established by Napoleon, largely through the adoption of the innovations instituted by Tresaguet. The basis of this system is the School of Roads and Bridges. This school is one of the finest technical schools in the world. It is maintained entirely at the expense of the national government. Highway engineers who are entrusted with the construction and maintenance of the roads of France are chosen from the graduates of this school. Out of the three hundred and fifty-five thousand miles of roads in France twenty-three thousand, eight hundred and twenty are closed as national roads and are, therefore, the property of the state. The remainder of the roads are maintained by local governments with occasional aid from the state.

Although the first known toll road, as given by Strabo, was the road leading from Babylon to Syria, the toll system was not definitely adopted in England as a means of

raising revenue for maintenance and repair of roads until 1346. This system reached its greatest popularity in the eighteenth century. By 1838 there were eleven thousand turnpike trusts throughout the kingdom. The cost of collecting tolls often equalled the income, as so many people were employed. In 1857 Ireland freed herself of toll gates. About twenty years later Parliament passed an act abolishing tolls in England.

When North America was settled, England's roads were in a very low state of development. Naturally the colonists brought these traditions from their mother-country. As they had no money to develop them, they fell into the practice of accepting a class of roads so poor that it has taken ages to overcome this short-sighted policy. In fact it has not been entirely overcome yet.

The first interest in a movement for better roads came nearly two hundred years after the first English settlement. The colonists followed their mother-country, not only in the methods of construction, but also in the methods of obtaining the necessary money. Private corporations were given state or national charters for clearing away the forests and grading the roads so that they could be passable for heavy wagons. These corporations furnished the capital for the construction of bridges and roads. Naturally, they charged toll to the vehicles using them. The first toll road in the United States was the Lancaster Pike between Philadelphia and Lancaster, built in 1792. This system of toll roads expanded very quickly until the introduction of railroads practically killed all interests in turnpike building

Virginia has taken first place in many phases of the nation's history. Therefore, it is not surprising to hear that she occupies a similar place in the history of roads in America. The first recorded American road was at Jamestown, Virginia.

Roads in Virginia can be traced back to the time of the Indians, before the country was settled by the English. An Indian trail ran from Wer-o-wo-co-mo-co, which passed what is now Gloucester Courthouse, to Middlesex. It was extended northward to Canada. Going south it crossed the York and James Rivers and ran into the Southern States. About ten miles of this road still exist, and is known under the name of the Indian Road. The present York River Road was at first a trail made by the Indians along the north shore of the York River, passing on to West Point.

When the colonists came from England, they settled near the shore of the ocean or some navigable stream so they could easily communicate with their mother-country. This is probably the reason why Virginia has been so backward in its road-making. The large plantations and the racial and religious differences of the settlers made them independent. They did not have to get to other parts of the state, so did not bother with roads. And then came the French and Indian War and the Revolution, which financially prevented any progress in road-making. One of the greatest drawbacks to this progress was the fact that the colonists attempted to follow England's laws. This involved inexperienced men for the construction.

In 1632 Virginia passed its first road law. The county courts were given the control of the roads in 1657, but it was five years before roads were placed on a good footing. This was accomplished by the appointment of surveyors to establish forty-foot roads.

The first road over the Appalachian Mountains was followed by Washington in 1754 and Braddock in 1775. This road was hardly more than a blazed trail between the Potomac and Monongahela Rivers. Daniel Boone laid the path for the Wilderness Road which immediately gained importance as a thoroughfare in the settlement of Kentucky and the Middle West. Another of the most important roads in Virginia before 1800 was the Alexandria Turnpike. The Valley Pike from Winchester to Staunton was one of the first macadamized roads in the state. Its charter was with a batch of internal improvement grants of March 17, 1831, but it was not authorized by law until March 24, 1838. This pike is noted historically as well as commercially.

The plank and toll roads were popular at this period. The roads were owned by private corporations. Usually the state owned about three-eighths of the stock. Toll gates were placed about every five miles. These roads grew more popular throughout the whole state until there was a regular network of them. The counties have gradually bought them. Now there are very few in the whole state.

During the Civil War, improvement in

roads came to an abrupt halt. For a long period after the war the people were too busy with re-construction to pay much attention to the road question. The establishment of a Bureau of Public Roads in 1893 by the United States Department of Agriculture did a great deal towards arousing public sentiment to the value of good construction and maintenance of the roads. The newspapers also supported the movement. The interest of the state was shown in the Virginia Good Roads Convention held at Richmond in 1894. Since then the people have gradually awakened to the fact that good roads are an absolute necessity for Virginia's progress.

The year 1906 marks two important events in the Virginia Good Roads Movement. A State Highway Department and a State Convict Force were established. Before this the state had a contract with the Davis Boot and Shoe Company of Boston, which hired the convicts at the penitentiary. It was a very one-sided contract from which the state derived a revenue about equivalent to the expenses of maintaining the convicts, including a fair rental for the factory which it became necessary to erect at the penitentiary. In 1906 the Lassiter-Withers Law was passed, which provided, in substance, "that certain classes of minor felonies, in the discretion of minor courts, might be sentenced to the roads instead of the penitentiary." Now the large majority of the convicts are used in the interest of the public upon the roads and in lime-grinding plants for the benefit of the farmer. The cost is about equally divided between the state and the county as the former furnishes food, clothes, transportation, and guarding of the convicts, while the county supplies materials, tools, teams, and pays the salary of a civil engineer appointed by the State Highway Commission.

The State Highway Department has supervision over all state money aid and convict labor work done throughout the state. During the last legislature the various state laws were changed and a State Highway System was formed designating approximately thirty-seven thousand miles of the fifty thousand miles in the state as the main highways to be constructed and maintained entirely by the state. "For the construction of this system the legislature has made available a one-mill tax of approximately $600,000, and the automobile tax, amounting to approximately $6000,000, together with the use of the State Convict Road Force. In addition to this the state contributes $700,000 annually, to be met by a like amount from the counties for the construction of their county highways. There is available two-thirds of the automobile tax for the maintenance of highways. From this source we receive $1,200,000 annually." (Statement made by G. P. Coleman, State Highway Commissioner).

In the counties the board of supervisors lays all levies for road and bridge purposes. Besides this amount the counties may vote bonds for road and bridge improvement. This money has to be spent under the supervision of an engineer appointed by the State Highway Department.

In 1916 President Wilson signed a bill generally known as Federal-aid Road Act. This was the beginning of the co-operation between the state and national governments as regards the road question. The Federal government did not attempt to build a separate system of national highways, but aimed to stimulate the construction of the roads of the country through the agency of the state highway deparments. It has accomplished a great deal. This act provided $75,000,000 for rural post roads made available on the following installments: $5,000,000 for 1917; $10,000,000 for 1918; $15,000,000 for 1919; $20,000,000 for 1920; $25,000,000 for 1921. The apportionment of this appropriation is based upon area, population, and mileage of rural delivery and star routes in each state. There were several provisions of this act; namely, Federal funds may be expended only for the construction of roads, may not exceed 50 per cent of the value of the roads, and in the expenditure of government funds in no case could exceed $20,000 per mile. The states were asked to comply with the following requirements before they could receive allotments of Federal-aid: "First, the state legislature should assent to the provisions of the act, or that the governors of those states in which the legislatures were not in session should assent pending the convening of the legislatures: second, that each state should have a state highway department, and that these departments should have direct supervision over

the construction of the roads on which Federal funds were to be expended; and third, that the Federal aid should be met by an appropriation of at least an equal amount of state funds." The states were required to decide upon a definite system of roads in the construction of which they wanted Federal aid. The following is the allotment of Federal aid in Virginia:

1917, $99,660.71; 1918, $199,321.42; 1919, $298,120.77; 1920, $288,946.90; 1921, $494,418.46.

In 1919 the President approved the amendments to the original Federal aid act which provided that the term "rural post roads" as used in that act was to be construed to mean "any public road, a major portion of which is now used, or can be used, or forms a connecting link not to exceed ten miles in length, of any road or roads now or hereafter used for the transportation of the United States mails. . . . ." This amendment gave an additional allotment of $992,052.95 in 1919; $1,488,079.42 in 1920; and $1,483,255.37 in 1921 to Virginia.

The states have to initiate the projects for Federal aid. In May 1920 two Virginia projects were approved. One of these was to concrete a distance of 0.55 miles in Stafford and Prince William counties. This little stretch of road on the Richmond-Washington pike, when finished will carry the traveller through Chappawansic Swamp, the worst piece of road on that highway. In August 1920 it took a party of tourists five hours to get around this half mile. Besides the time wasted, the autoists had to pay over ten dollars to be pulled out of the mud in the detour. This project will cost $39,710, out of which the Federal government will pay $14,000. The other project is in Chesterfield County on the Richmond-Petersburg turnpike. The Federal aid in concreting a stretch of 8.94 miles is $176,341, half of the estimated cost. In May of the same year four project agreements were executed; one each in Tazewell, Princess Anne, Fauquier, and Loudon counties. In each case the Federal aid was one-half of the estimated cost of construction.

Any wide-awake and thinking Virginian will see that improved roads are a necessity to his state's progress. They are not only valuable to Virginia, but also to other states and to the Union. They are invaluable to the farmer as well as to the city people. It is difficult to determine which derive the most benefit.

Improved roads reduce the cost of hauling. How is this accomplished? It is the result of three causes: the betterment of the road surface, the reduction of the road surface, the reduction of the grade, and the shortening of the length. It is easy to see that foods can not be transportated to the railroads or farm produce to the market if the road surface is not hard and smooth. Probably just as important as the hard surface is the grading. On a macadamized road the maximum grade allowed must be low in order to get the best results from the hard surface. The steep grades are very dangerous in winter as they are so slippery. The maintenance charges are also very high.

When the roads were first built, there was a tendency to build along the farm boundaries in a straight line. In the improvement of these roads it has been found that the gain in distance in passing around the hills, instead of over them, is very slight and in a number of cases the distance is the same.

In 1908 merchants hauling goods from Ben Hur to Jonesville in Lee County required a two-horse team for 2,500 pounds when the roads were in ordinary condition. Now that the roads have been improved these merchants haul 30 sacks of fertilizer which weigh 200 pounds each, and use two mules. They can now make two trips a day instead of one as they used to make.

This reduction in the cost of hauling will also cause a lowering of prices on the farmers' produce. If the farmers' produce can be decreased in price, there will be a similar reduction in the prices of everything. The H. C. L. will be greatly lowered. Of course this will come slowly.

Farm lands will increase in value very much if they are on improved roads. In Lee County a tract of 188 acres was supposed to have sold for $6,000. After the roads were improved, but no improvements were made on the land, the same farm sold for $9,000.

There are two other economic advantages of road improvement, namely, increase of tourist travel and increase in diversified farming. It is plain that the better the

condition of the roads, the more tourists there will be in our state. We want people from other states to enjoy the beauties of Virginia as well as ourselves, and we know that they will not tour the state if our roads are not of the very best. The automobilists have done a great deal for the Good Roads Movement in our state. They have been instrumental in getting pamphlets and literature about this movement distributed throughout the state. A number of them have made speeches arousing the people to the need of good roads. Thus we can consider them as an economic advantage. By diversified farming we usually mean a change from staple crops, such as corn and wheat, to more perishable products, such as fruits and garden truck. With bad roads the farmers had to make the shipping of their products suit the condition of the roads over which they had to haul. Often they would lose a whole crop just because the roads were in no condition for hauling to be done over them. If the roads are improved, the farmer will be able to raise any kind of product.

The social advantages of road improvement are threefold. Roads aid in the improvement of the schools; this is a point which is of vital importance to the public mind of today. The tendency in the rural districts now is to do away with the one-room school and have consolidated schools. This will be an impossibility in a number of the counties if the highways are not improved. The children can not get to the schools over the roads in the condition in which quite a number of them now are. The rural delivery services can also be greatly benefited by this improvement. The Fourth Assistant Postmaster General, in his report for the year ending June 30, 1909, writes: "Essential factors in the value of rural delivery as a postal facility are speed and regularity, and the attainment of a satisfactory standard in these particulars is absolutely dependent on improved roads." "Social activities in rural communities need all the encouragement and stimulus that can reasonably be given. All social activities take time and energy, and the country-road condition therefore is a prime consideration to enable farmers and their families to afford time for social intercourse. The unnecessary subdivisions of the church into numerous small buildings throughout many portions of the country has necessarily operated to weaken the attendance, but the concentration of church funds and church attendance is dependent upon improved road conditions."

Earth, sand, clay, gravel, macadam, bituminous, and concrete are the most widely used road materials in Virginia. Most of these materials are found in the state. This saves money as very little of the material has to be shipped into the state. Sand and clay are the only local materials available in the extreme eastern section. In the middle eastern section large deposits of gravel and some ledges of suitable stone are found. Water-bound macadam roads with some surface are the most commonly used in the section west of the Blue Ridge. There are large deposits of gravel and soil and varying quantities of suitable stone for macadam, concrete, and bituminous roads in the middle section east of the Blue Ridge. Statistics show that in 1919 the State Highway Department supervised the construction of the following kinds of roads: 37.34 miles of earth road; 163.79 miles of sand clay; 41.81 miles of gravel; 77.23 miles of macadam: 6.4 miles of bituminous; 9.26 miles of concrete; and 11.71 miles of miscellaneous materials.

Road lighthouses are to be placed on the Virginia highways to mark the dangerous places. Placed so as to warn the public day and night of dangerous curves and railroad crossings, accidents on Virginia highways should be reduced to a minimum. These lighthouses operate on the same principal as lighthouses at sea, flashing at intervals warnings to traffic. Acetylene gas, placed in a large holder, which requires filling once a year, illuminates the lighthouse. It works automatically, flashing red light to indicate absolute danger, such as railroad crossings or an extremely dangerous section of the road; yellow indicates curves with an arrow showing the direction of the curve; and green lights will warn of congested traffic and need of cautious driving. These lights have already been put on parts of the State Highway System as an experiment. If they prove successful, the whole system will be marked with them.

Roads in Virginia are in a better condition now than they have ever been in. The most significant fact, though, is that they

are being worked all over the state. Tourists of last summer reported that no matter which section of the state they were in, they would have to detour on account of road construction.

Mecklenburg county ranks first in the per cent of surfaced roads. This county can boast of 39.52 per cent of its total mileage as being surfaced. Chesterfield comes close behind her with 33.75 per cent. Rockingham, Dinwiddie, Henrico, Charlotte, and Greensville are next in order.

Virginia is slowly, but surely, awakening to the importance of good roads. It is encouraging to note that in 1904 seventy counties reported no surfaced roads, while in 1914 there were only sixteen which had to make such a report. It is a challenge to each and every individual in the state of Virginia to see that in 1921 not a single county will be able to make such a report, and that the total mileage of improved roads in Virginia surpasses all other states in the Union.

ANNE B. GILLIAM

III

PASTORAL ROMANCE

SECOND INSTALMENT

ENGLISH—GREENE: PANDOSTO

Pastoral fiction in England enjoyed but a brief era of prosperity, and the four important romances that it produced were written in three years, from 1588 to 1590. Pastoral poetry was popular from Spenser's time to Milton's, and pastoral drama was often attempted during the Elizabethan period, but the important fiction writers were but three—Greene, Lodge, and Sidney. Greene's *Pandosto* (1588) is famous as the source of Shakespeare's *Winter's Tale*. In certain details, Greene's story is reminiscent of *Daphnis and Chloe,* which was translated into French by Bishop Amyot in 1559, and into English by Angel Day in 1587. Greene, however, instead of beginning with the childhood of his hero and heroine, starts with the preceding generation, with the story of the heroine's father. Pandosto, king of Bohemia, suspects unjustly that his wife Bellaria is in love with his friend and guest Egistus, king of Sicilia. Pandosto orders his cupbearer to poison Egistus, but the servant warns Egistus instead, and flees with him to Sicilia. Pandosto imprisons Bellaria, refuses to acknowledge the child she bears, and sets the baby adrift in an open boat, accompanied only by the inevitable "tokens." Then, at Bellaria's plea, Pandosto inquires of the oracle of Apollo as to his wife's guilt, and learns not only that she is innocent, but that "the king shall live without an heir, if that which is lost be not found." The oracle has no sooner been read than news is brought of the sudden death of Garinter, Pandosto's son. Bellaria, at this intelligence, dies of grief, and Pandosto, not very strangely, is visited by remorse.

The exposed child, meanwhile, has drifted to Sicilia, where she is found by the shepherd Porrus, who names her Fawnia, and rears her as his daughter. Fawnia grows up to be a beautiful shepherdess, so beautiful that Dorastus, the son of King Egistus, falls in love with her at first sight. To win her affection, he visits her in pastoral dress, since she tells him she can love him only if he becomes a shepherd. Dorastus knows that his father will not consent to his marriage with Fawnia, and so, to avoid trouble, the lovers flee, accompanied by Porrus. The usual storm arising, their ship is wrecked, and they take refuge in Bohemia, where Dorastus, fearing the hostility of Pandosto toward his father Egistus, passes himself off as Meleagrus of Trapolonia. Now Pandosto, who has evidently long since forgotten his remorse at Bellaria's death, at once falls in love with Fawnia, not knowing that she is his daughter. To further his designs against her, he imprisons Dorastus. Egistus, hearing of his son's plight, sends to Pandosto, revealing Dorastus' identity, and demanding his release and the punishment of Fawnia and Porrus. In this extremity, Porrus shows the tokens found with Fawnia; and Pandosto, recognizing them, embraces her as his daughter. To make the happiness of the lovers complete, the wicked Pandosto obligingly dies, and Doratus, married to Fawnia, rules in his stead as King of Bohemia.

Though Greene is handicapped in this work by having two plots to combine into one, he seems to make a greater effort toward unity than any of his pastoral predecessors since the time of Longus. His story is not complicated by inserted tales or by digres-